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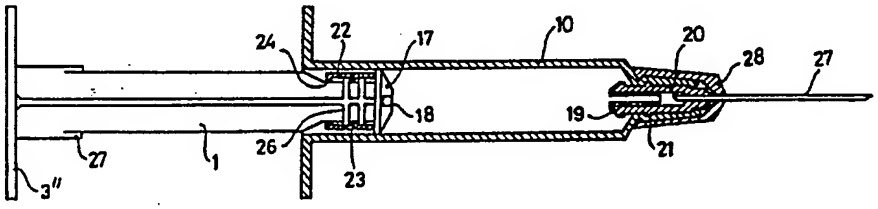

(57) Abstract

A safety assembly for an injection syringe, which syringe consists of a liquid container arranged or to be arranged within a casing (10) and having a piston (17) shiftable therein, a piston rod unit (1) provided with an external actuating element (3) and coupled or to be coupled with the piston, a needle foot (20) latched or to be latched at the other end of the casing with a hollow needle (27) communicating or to be communicated with the interior of the liquid container, said piston rod unit being provided with means (13) for unlatching the needle foot and to couple it with the piston rod unit, in order to allow to retract said foot together with the needle into the casing. According to the invention the piston rod unit comprises two parts (3, 5) which are mutually movable in the axial direction, one part being formed by the piston rod (1) or being connected thereto, and the other one comprising an unlatching element (8, 13, 22).

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Protection assembly for an injection syringe.

The invention relates to a safety assembly for an injection syringe, as defined in the preamble of claim 1.

Such injection syringes are known from EP-A 0 360 313 not published in time. Therein the needle can be fully retracted after use of the syringe, and can be bent if desired, in order to prevent effectively injures by the needle and re-use of the syringe.

It is an object of the invention to improve such syringes still more, in order to allow the injection liquid container to be partially emptied and/or to prevent refilling of this container before coupling the needle foot with the piston rod unit by retracting this unit. Moreover it is an object of the invention to prevent, in the case of such syringes which are to be filled before use with injection liquid by aspiration, that, when expelling air before aspiration, the piston rod unit will be coupled with the needle foot.

To that end the invention provides a safety assembly according to the characterizing portion of claim 1.

For obtaining the first object in injection syringes having an unlatching element which is shiftable outside the liquid container, the assembly according to the invention has the characteristics mentioned in claim 2 or 3.

For obtaining the second object in injection syringes having a piston rod unit which is or can be fixedly coupled with the piston, the assembly according to the invention has the characteristics of claim 4. For obtaining the third object, the assembly according to the invention has the characteristics of claims 5..8.

The invention will be elucidated below by reference to a drawing, showing in:

Fig. 1a a lateral view of a first embodiment of a piston rod unit according to the invention without the corresponding

injection syringe;

Fig. 1b a cross-section according to line 1B-1B of Fig. 1a;

Fig. 1c a view corresponding with Fig. 1a of said unit in an other condition;

Fig. 2 a cross-section of an other embodiment of a piston rod unit according to the invention and of the adjacent terminal portion of a corresponding injection syringe;

Figs. 3a and b a third embodiment of a piston rod unit in two different conditions; and

Fig. 3c an exploded perspective view of a practical embodiment of the unit of Figs. 3a and b.

In the drawing only those elements have been shown which are required for the description of the piston rod unit according to the invention. For the remaining parts of a corresponding injection syringe, reference can be made to EP-A 0 360 313, and in particular to the Figs. thereof to be mentioned below.

The unit according to the invention shown in Fig. 1 is intended to be used in injection syringes with separate liquid containers (so-called carpules) to be provided in a syringe casing, e.g. as shown in Figs. 1 and 2 of the EP-application mentioned above.

In these known syringes, the liquid container is provided with a piston, and is closed, at the other extremity, by a plug which will be pierced by the inner end of an injection needle when a needle foot is placed on this extremity. This needle foot is latched in the syringe casing. When the piston is completely pushed into the liquid container by means of a piston rod unit, and the complete contents thereof are driven outwards through the needle, a sleeve which is shiftable around this container and which forms a part of this unit engages the needle foot and latching means thereof, the latter then being released, and the foot will be coupled with this sleeve in order to allow it to be pulled into the casing. Such syringes are used specially by dentists.

If, however, only a part of the contents of the container

are to be used for an injection, the remainder thereof should be driven out before the coupling with the needle foot can take place. In order to avoid this objection, the piston rod unit of Fig. 1 can be used.

This unit comprises, to that end, and in the manner known from the EP-application mentioned above, a piston rod 1, e.g. with a cross-shaped cross-section, one extremity thereof joining a disc 2 or the like engaging the piston. At the other extremity, this rod 1 is provided with a pressing element 3, on which a pressure can be exerted by means of the thumb, as indicated by an arrow 4 in Fig. 1a.

This pressure element 2 forms the bottom of an eye 5, the terminal edges 6 thereof gripping behind the edges of the pressure element 3, so that, when pressing on the pressure element 3, the eye 5 is taken along, and, moreover, when the thumb pulls in the opposite sense of the arrow 4 on the eye 5, the pressure element 3 will be pulled along with the eye 5. The eye 5 is connected by means of connecting strips 7 with a coupling piece 8 which will engage the needle foot of the syringe when the unit has been completely pushed into the syringe casing and the liquid container has been emptied.

If, however, only a portion of the liquid contents of this container should be injected, the thumb, after this has taken place, will be taken from the eye and will be applied against the outer side of the eye 5, whereafter, as shown in Fig. 1c by an arrow 9, the eye 5 is pressed further inwards. Then the edges 6 of the eye 5 will release the pressure element 3, which, then, stays behind as shown. The sleeve 8 will, eventually, engage the needle foot, and the piston of the liquid container will no longer be displaced, so that the liquid remainder will remain therein.

In particular the eye 5 can be slightly flexible, so that, when pressing on the outer side, which is in particular concave, the edges 6 will deviate somewhat so as to simplify the release thereof.

In Fig. 2 an other unit according to the invention is shown, which is in particular intended for an injection

syringe of, for instance, the type of Fig. 4 of the EP-application mentioned above, in which case the piston rod 1 is or can be fixedly connected with the piston of an injection syringe, and the piston rod of the piston is coupled with the needle foot at the end of its stroke.

However, if this coupling has not taken place, the piston can be retracted without taking along the needle foot, so that, then, the nearly emptied syringe might be refilled by aspiration through the hollow needle.

In order to prevent this, the casing 10 of the syringe is, at the terminal portion shown, at its inner side provided with elastic latching tongues 11 which cooperate with notches 12 of the piston rod 1 in such a manner that retraction of this rod by more than the mutual notch distance is prevented.

At the end of the rod 1 a pressure element or eye 3' is provided, and around the rod 1 and against this eye a sleeve is arranged with some friction, which is provided with a collar 14.

At the end of the stroke of the rod, the sleeve 13 arrives at the tongues 11 which will be pushed outwards, and will then grip behind the collar 14. At the same time a coupling with the needle foot has been obtained, for instance because internal claws 15 engage a knob 16 of the needle foot. When retracting the eye 3', the needle foot is taken along, but the sleeve 13 remains in the casing 10.

It will be clear that in the case of other needle foot coupling types, the same protection against retraction can be used. Also in the embodiment of Fig. 1 this protection can be used, and then the notches 12 can be provided in the portion connected with the eye 5 and the sleeve 8.

In Fig. 3 still another piston rod unit according to the invention is shown, which is, in particular, intended for an injection syringe according to Fig. 5 or 6 of the EP-application mentioned above.

The piston rod 1 of the considered unit is, at its outer extremity, provided with a pressure element 3", and carries, at its other extremity, a piston 17, and the edge of a cavity

18 formed in its end face can, then, engage claws 19 of a needle foot 20 of the syringe 10, the claws 19 then being bent, and latching lugs 21 being released and the foot 20 being unlatched

This piston 17 is, in the present case, and as appears more clearly from Fig. 3c, provided with rearwardly extending tongues 22, which form a unitary structure with the piston 17. In the middle portion of each tongue an elastic lip 23 is bent outwards, and its free extremity has an inwardly directed thickened terminal rim 24. These lips 23 and terminal rims 24 form first and second latching lugs. The adjacent end of the piston rod 1 is provided with two circumferential collars 25 and 26.

In the initial condition shown in Fig. 3a, the first latching lugs 28 extend into the space between the collars 25 and 26, and the second latching lugs are situated at some distance beyond the second collar 26. These lugs form a connection between the piston 17 and the piston rod 1 as soon as the piston is inserted into the injection syringe 10, so that the tongues 22 cannot be bent outwards anymore.

When a pressing force is exerted on the pressure elements 3", in order to expel the air after inserting the needle through the plug of an injection liquid container, this pressing force is transmitted by the collar 26 towards the ends of the tongues of the first latching lugs 23. The distance between the piston 17 and stops 27 arranged near the pressure element 3" for delimiting the piston stroke is such that, when fully inserting the piston rod 1, the piston head with the cavity 18 will just not reach the claws 19 of the needle foot 20, so that no coupling with the needle foot 20 can take place.

In order to suck in injection liquid into the injection syringe, the piston rod 1 is retracted. The tongues 23 will now slide along the collar 25, after which their extremities will snap behind the other surface of this collar as shown in Fig. 3b. At the same time the second latching lugs or terminal rims 24 have reached the second collar 26. The piston 17 is now coupled with the rod 1 for both pulling and pressing

forces, which coupling cannot be disrupted again.

The length of the piston rod/piston unit has now been increased sufficiently so that, when pushing inwards the piston 17 afterwards, a coupling with the needle foot 20 can be obtained, and the latter can be retracted then into the syringe 1. It is, of course, also possible to provide additional locking means for preventing the complete removal of the piston 1 from the syringe 10 and making the syringe re-usable thereafter.

The unit of Fig. 3 is, in the first place, intended for syringes in which the aspiration of injection liquid takes place through a needle 27 fixed in the foot 20, the needle being provided with a cap 28 from which the needle can be retracted through the foot 20. It is also possible to put a wider aspiration needle on the end of the syringe, and to replace it afterwards by an injection needle provided with a fitting adapted to the foot 20, which fitting will be retracted together with the foot 20.

In this embodiment, sterile air is present in the syringe, which, after inserting the needle into an injection liquid container, will be expelled into this container, so that no contamination of the contents thereof can take place.

It will be clear that the assembly of lugs 23, 24 and stops 25, 26 can be realised in many other ways, and should not necessarily be situated near the piston 17.

It is also possible to use a shiftable needle foot 20 (not shown) which, in the initial condition, is shifted so far outwards that no coupling with the piston can take place, and which, for instance by means of a snap lock which is released at a given pressure, is retained, and then the same lugs 21 may be used.

When putting on an aspiration needle, the foot 20 remains in this position. The injection needle fittings can be put on the extremity of the needle foot 20 and can be coupled therewith in order to be retracted afterwards together with the foot 20. When putting on the foot 20 will be shifted towards the position shown in Fig. 3, so that coupling with the

piston can take place. The aspiration needles have a fitting which cannot engage the foot 20, and will, therefore, not shift the foot.

C L A I M S

1. A safety assembly for an injection syringe, which syringe consists of a liquid container arranged or to be arranged within a casing and having a piston shiftable therein, a piston rod unit provided with an external actuating element and coupled or to be coupled with the piston, a needle foot latched or to be latched at the other end of the casing with a hollow needle communicating or to be communicated with the interior of the liquid container, said piston rod unit being provided with means for unlatching the needle foot and to couple it with the piston rod unit, in order to allow to retract said foot together with the needle into the casing, **characterized in that** the piston rod unit comprises two parts which are mutually movable in the axial direction, one part being formed by the piston rod (1) or being connected thereto, and the other one comprising an unlatching element (8, 13, 22).

2. The assembly according to claim 1, the unlatching part of the piston rod unit being shiftable outside the liquid container and being adapted to be engaged with the latch of the needle foot and to be coupled with said foot, **characterized in that** the actuating element of the piston rod unit consists of two parts (3, 5) connected, respectively, with the piston rod (1) and the unlatching element (8), which parts (3, 5) are made in such a manner that during actuation either the part (5) connected with the unlatching element, or both parts (3, 5) are being displaced.

3. The assembly of claim 2, in which the actuating element is annular, **characterized in that** the bottom part (3) of the ring is connected with the piston rod (1) and the remaining part (5) with the unlatching element (8), the connection (6) between both parts of the ring being so that when pressing on the bottom part (3), also the other part (5) is taken along, whereas when pressing on the remaining part (5), the bottom part (3) can remain behind.

4. The assembly according to any one of claims 1..3,

for an injection syringe in which the piston rod unit is fixedly connected with the piston or can be coupled therewith, characterized in that the piston rod unit is provided with a plurality of notches (12) and the casing (10) is provided with locking tongues (11) which can engage said notches (12) in such a manner that the piston rod unit cannot be retracted anymore, and in that the unlatching element comprises a sleeve (13) clampingly arranged on the piston rod unit, and adapted, when reaching the coupling position of this unit with the needle foot, to press these locking tongues (11) out of the locking position, said tongues (12) being adapted to grip behind a collar (14) of said sleeve (13) in order to prevent said sleeve (13) from being retracted.

5. The assembly according to claim 1, intended for an injection syringe in which the liquid space before use is to be filled by aspiration from an injection liquid container, and in which the unlatching element of the piston rod unit can be brought into engagement with the latch of the needle foot, characterized in that the parts (1, 8) of the piston rod unit, in the initial condition, are mutually latched against pressing forces exerted on said unit, in which condition the length of this unit is insufficient for reaching the needle foot (20) with the unlatching and coupling element (18) when pressing said unit into the syringe, which mutual latching will be released when exerting a pulling force for the first time, after which said parts shift into a second position, and are latched then against pulling and pressing forces, in which second position the length of the unit is insufficient for reaching the needle foot.

6. The assembly according to claim 5, characterized in that a portion of two sets of latching lugs (23, 24) situated at the mutual shifting distance, and the other portion is provided with two sets of corresponding latching notches (25, 26), the set of latching lugs (23) at the needle foot side is situated, in the first position, between corresponding stops (25, 26), and the other set of latching lugs (24) is situated beyond the other set, the first set of lugs (23) and/or

stops (25) being allowed to slide along each other when exerting a pulling force.

7. The assembly according to claim 6 for an injection syringe having a piston which is, at its end surface, provided with portions engaging the needle foot, characterized in that the piston (17) is provided with rearwardly directed tongues (22), which, at their extremities, are provided with the second set of latching lugs (24), and, in the middle of elastic lips (23) pressed out, forming the second set of latching lugs, and in that the piston rod (1) is provided with collars (25, 26) forming the second latching lugs, which tongues and collars also form the connection between the piston rod (1) and the piston (17).

8. Injection syringe, provided with a safety assembly according to any one of the claims 1..7.

9. An injection syringe having a needle foot provided with elastic claws, designed for engaging adapted parts of the piston rod unit, and to be bent outwards in such a manner, that the latching with the injection syringe extremity is released, characterized in that the needle foot (20), in the initial condition, is retained in a position in which its claws (19) cannot engage the piston rod unit (1, 17), and in that the injection needles (27) to be used with said needle foot (19) have a fitting which, when being put on the needle foot (20), will take along the latter over such a distance that its claws (19) can engage the piston rod unit (1, 17).

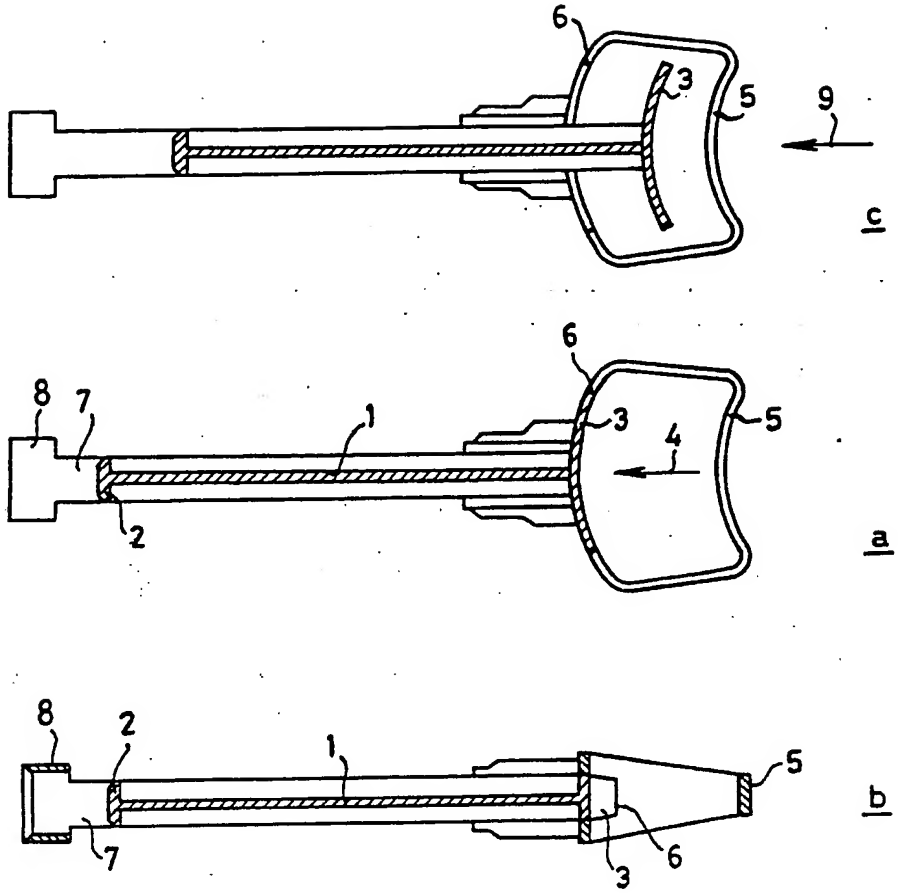

Fig: 1.

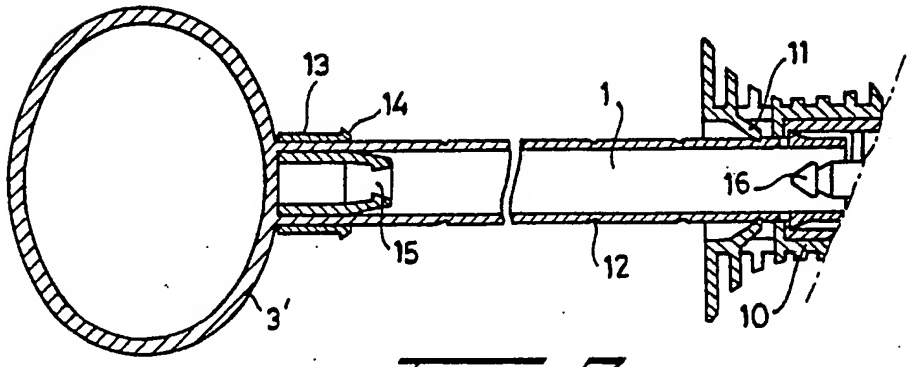

Fig: 2.

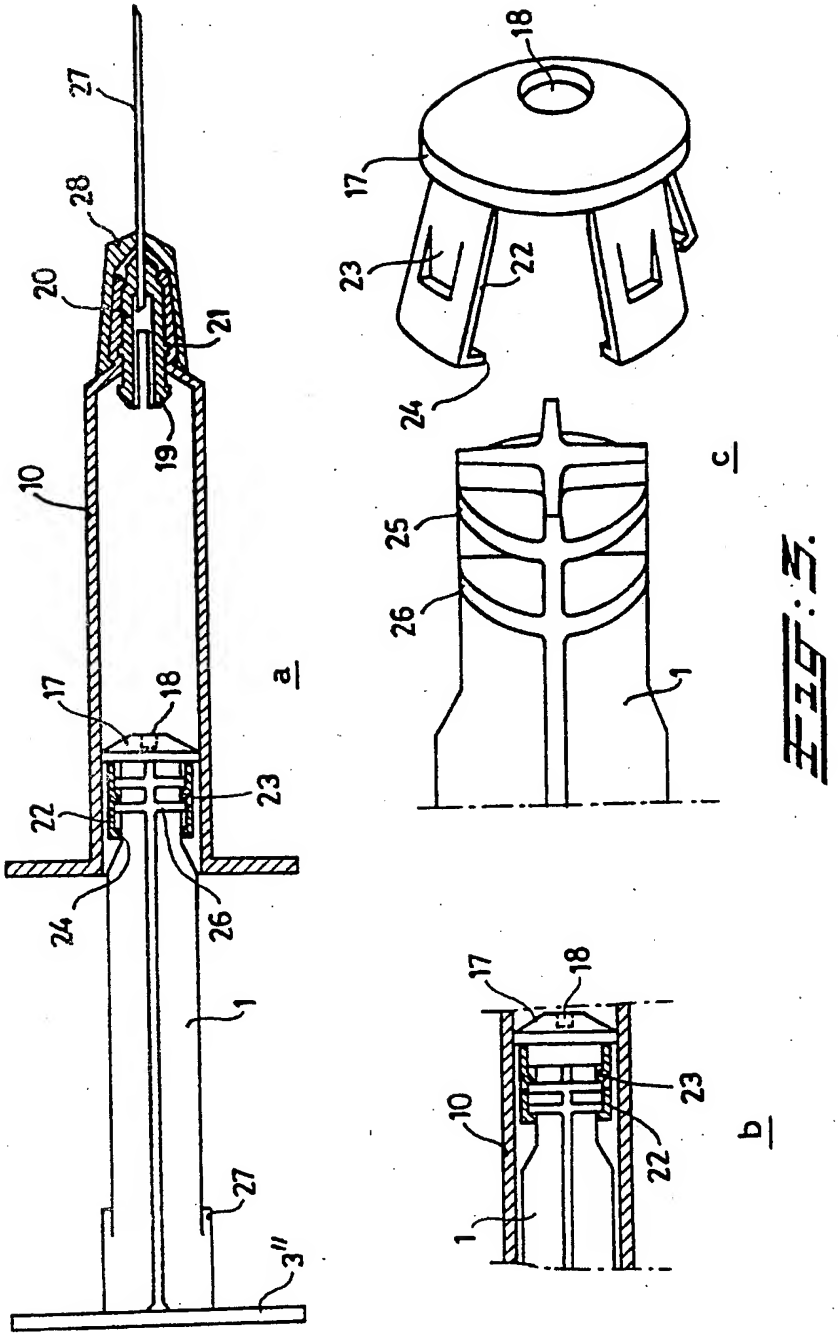
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FIG. 3.

INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 91/00035

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A61M5/32 ; A61M5/315

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A61M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	WO,A,8 900 432 (ASSISTANCE PUBLIQUE) January 26, 1989 see page 14, line 17 - page 15, line 9	1,8
A	see page 6, line 2 - line 14; figures 1-3,10,11	4
X	EP,A,0 272 035 (NATIONAL RESEARCH DEVELOPMENT) June 22, 1988 see column 5, line 47 - column 6, line 30; figures 1-3	1,2,8
A	EP,A,340 899 (FARBSTEIN) November 8, 1989 see column 3, line 19 - column 4, line 32 see column 6, line 6 - line 45; figures 3,9,10	1,4,8
A	CH,A,669 910 (RITZI) April 28, 1989 see the whole document	1,4,8
A	US,A,4 838 870 (HABER ET AL) June 13, 1989 see column 4, line 45 - line 53; figures	1,8

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
12 JUNE 1991	16 JUL 1991
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	CLARKSON P.

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. NL 9100035

SA 45210

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/06/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-8900432	26-01-89	FR-A- 2618075	20-01-89
EP-A-0272035	22-06-88	AU-B- 595408	29-03-90
		AU-A- 8253887	16-06-88
		GB-A,B 2200283	03-08-88
		JP-A- 63192453	09-08-88
		US-A- 4957490	18-09-90
EP-A-340899	08-11-89	JP-A- 2011163	16-01-90
CH-A-669910	28-04-89	None	
US-A-4838870	13-06-89	None	